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EDITORIAL NOTES

WHAT PROGRESS?

THE electricity industry, just like our own, was invited last year by the Minister of Fuel and Power to give him its views as to the position to which it would aspire in the general reorganization after the war, though it is not recorded that the electricians, any more than the Gas Industry, were favoured by the Minister with an "official" cut-and-dried plan of the post-war world into which we all must endeavour to fit. The first electrical fruits of this request followed last week, some four weeks after submission of the Gas Industry Report. It cannot be used as a big stick with which to beat the Gas Industry for its own lack of unity, since, in the absence of agreement within the electrical industry, the present memorandum has been submitted independently by the Association of Electric Power Companies. In 1939, company undertakings supplied about 40% of the country's total electricity, and the Association generated about 70% of this company output, so that the memorandum represents a minority view. Another separate report is expected from the Association representing the municipal undertakings and, while it is expected that the two will agree in principle as to the standardization of tariffs, voltages, and technical matters generally, they have apparently agreed to disagree irreconcilably on the matter of complete public ownership.

The Association of Electric Power Companies agree in general with the recommendations of the 1936 McGowan Committee, which, it will be remembered, deprecated the dislocation, without compensating benefit to the community, which would occur through exercise of rights of purchase by local authorities if applied piecemeal to existing comprehensive undertakings. And this, be it noted, is a very real statutory threat hanging over the heads of many of them. The McGowan Committee did, however, suggest that schemes of reorganization should make provision for the ultimate long-term public ownership of all electricity undertakings, and the memorandum advocates a postponement of such compulsory acquisition beyond the 50-year term envisaged by the McGowan Report.

An interesting recommendation of the Association's memorandum is that a committee should be appointed in each district to prepare a draft plan for improvement of electricity distribution along the lines recommended by the McGowan Committee. And it will be remembered that this Committee envisaged integration, where practicable, by the absorption of the smaller or less efficient undertakings by larger and more efficient ones. It is interesting to compare this suggestion for an official examination district by district of the possibilities of integration with that of the Gas Industry Report which proposes a tribunal, set up by the Industry itself, to examine the situation of the whole country. But of course it is necessary to remember that the Gas Industry possesses no such fatherly authority as Commissioners to whom it could appeal for the rendering of such a service.

It may, or it may not, at the present juncture desire to have Commissioners or their equivalent; views are held both ways in various sections of the Industry. But the fact that it has no such body seems to make all the more urgent the formation of an agreed central body of its own electing. For the reason that it does have Commissioners, perhaps, the electricity industry seems to rub along pretty well without even the degree of internal "national body" organization which we have had up to the present. Our own Industry, on the other hand, appears to be in a condition of floundering, in a state of incoherence which seriously threatens to develop into speechlessness, and this after an effort extending over at least two years to evolve an acceptable central authority. We have heard of no progress with the formation of the British Gas Association since the issue of the Planning Report (which, of course, is not necessarily to say that none has been made), but we are not alone in thinking it very urgent that a central body should be formed which, by general agreement, could speak for the Industry as a whole.

It becomes more and more obvious as time goes on that the success of such a body—even its establishment upon lines which promise success—demands a very considerable degree of decentralization, and the assumption by districts of a real measure of responsibility for their own affairs. Only if each district knows its own mind can elections to a central body make that body really representative of the opinion of the country as a whole. Again, we are without much information as to what is being done about it in the Provinces, but we hope the urgency is realized, even though it may be obscured at times by the ever-present problem of keeping gasholder crowns above ground level.

FURTHER REPORTS EXPECTED

IN the meantime we understand that a report, giving their views of Gas Industry post-war reconstruction, is likely to come from the Association of Municipal Corporations, which has declared itself in favour of the municipalization of all public utilities. This should be an interesting document, and we look forward to seeing how the subject is tackled. It is known that there are municipalities which own some of the best undertakings in the land, and others which are no better than they should be. There are probably some which own no gas undertaking, but would like to, yet others which have no desire to own anything of the kind, and some again who would like to see their own and everybody else's undertakings nationalized.

Then there is the Association of Smaller Municipal Gas Undertakings which can justly claim to have among its members and those eligible for membership some of the most efficient and progressive elements in the Industry. From this Association, too, we are led to expect a report; in the meantime we have heard enough about them to know that they are an extremely tolerant body who wish to interfere with nobody, and it would seem that their role is principally to watch the interests of their member undertakings in any schemes which may be devised for the future lay-out of the Industry. It we look at the Post-war Planning Committee, we have to concede that undertakings of this size had little or no voice in the proceedings. Yet the Report fully agreed that size in itself is no just criterion of efficiency, and possibly the mistrust with which we believe this Association views the suggestion of a compulsory integration tribunal may not be entirely justified. But there again we quite agree that it all depends upon the system by which such a tribunal is arrived at. If it could derive its authority from a democratically elected central body, it could surely be relied upon to do its work impartially in the best interests of the consumer, which would equally be in the best interests of the Industry. Whatever his personal politics, the good citizen does not refuse to obey the laws enacted by Parliament even though it may not represent the same shade of opinion as his own. We believe it will be found that this Association stands fully for a policy of co-operation, but, if integration is to be the order of the day, we still consider that some directing, if not driving, force will have to be found before anything of substance can be achieved. There are men of vision representing undertakings in this group, and their proposals will be entitled to every respect and consideration.

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CONTINUOUS CARBONIZATION

WE begin to-day publication of the Paper by Dr. Haffner and Dr. Weston, of the Gas Light and Coke Company, reference to which was made in these columns in the "JOURNAL" last week, on the mechanism of carbonization in continuous vertical retorts. As we have already mentioned, the method of attack—to "freeze" the retorts under normal working conditions—is original, strikingly interesting, and, it seems to us, opens up great possibilities of arriving at a closer understanding of the continuous carbonizing process. We would call attention here to a few of the points clearly brought out by the investigation. In the retorts under consideration (Glover-West of bell-bottomed design) carbonizing Durham run-of-mine coal, it has been demonstrated that the expansion of the charge on changing from coal to coke takes place wholly in a horizontal direction. The density of the block of coke just above the steaming chamber—a block which substantially occupies the whole of the cross section of the retort—is somewhat higher even than the figure calculated from the increase in area of the retort alone; and the Authors pointed out that if both vertical and horizontal expansion of the charge had occurred, then a lighter coke would have been formed.

One of the retorts provided an excellent example of irregular travel of the charge. Halfway down the retort on the offtake side was a void 3 ft. deep by 15 in. wide, and it would appear that the void was descending as such at a very much reduced speed. The low ash content of the material removed from the top of the charge immediately under the offtake pipe showed this to be largely composed of pitch refluxed from the pipe. If this crust is not thoroughly broken up it can remain stationary for a time and the charge lower down moves on, so leaving a void. Presumably the void in question was formed in this way through indifferent rodding some five or six hours earlier. Through the absence of heat absorption by coal the void would become unduly hot and cause active overcracking. This was evidenced by heavy deposits of lampblack on the surface of the coke and the retort wall. The extractor, which continued to operate at its usual speed, released the normal volume of coke, and the side opposite the void was speeded and over extracted to a degree measured by the volume of the void. Smooth coal travel must therefore be dependent upon retaining a continuous charge structure; this did not apply in the case we are mentioning, and overcracking due to the void and under-carbonization due to the preferential extraction must have serious effects upon the efficiency of carbonization. Further, if a charge only moves immediately after rodding, the same considerations would apply —*i.e.*, there would be a certain degree of static carbonization, and large zones for encouraging vicious gas cracking would be formed by top sticking. All this, the Authors stressed, doubly emphasizes the importance of a rigid rodding discipline when carbonizing Durham run-of-mine coals.

Location of scurf and wear on the retort walls could be readily visualized. It was seen that scurf became of negligible thickness 16 ft. down, and after that the retort surface was exposed and the wear on the brickwork became pronounced. The surface of the scurf was scored with vertical scratches, which must have been cut with the pressure of the descending monolith of coke. Rate of scurf deposition is faster than removal by scratching; however, but for this wearing of the scurf, scurfing would need to be carried out oftener, and but for scurf deposition the retorts would be badly worn by the descending charge. The protective effect of the lubricating action of scurf is clearly shown in the Paper, which sets out the percentage wear on the brickwork at different levels. And at the meeting at which the Paper was presented, a model of the process was exhibited indicating the principles involved in the structure of the charge and the mechanism of its movement in the retort. Altogether a fascinating Paper *cum* demonstration; and we feel sure that models of the kind would prove of great help to the serious student of gas-making.

Personal

Mr. BERNARD CLARKE, J.P., Manager, Engineer, and Secretary to and a Director of, the Stamford Gas Company, has been elected to fill a seat on the Stamford Town Council.

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Mr. WILLIAM BARRATT has retired from the post of Chief Accountant in the Manchester Gas Department after over 46 years' service. The Gas Committee has expressed appreciation of his long and faithful services.

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Mr. A. J. DORAN, Chief Chemist, Edinburgh Gas Department, has resigned his post as lecturer in Gas Engineering at the Heriot-Watt College, after 18 years' service. He is succeeded by Mr. S. G. MELVILLE, Chief Technical Assistant, Edinburgh Gas Department.

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Mr. T. WATSON has been appointed to the Board of Directors of General Refractories, Ltd., Sheffield. Mr. Watson joined the Company in 1929, and since 1931 has held the position of Commercial Manager.

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Mr. P. H. WILSON, O.B.E., M.I.Mech.E., Assistant Managing Director (Technical) of the Stanton Ironworks Company, Ltd., has been appointed Deputy Managing Director.

Obituary

Mr. ALBERT RIGBY, senior Director of John Rigby & Sons, Ltd., Low Moor, Bradford, died on Nov. 23. He had been actively associated with the Company for more than 50 years.

Letters to the Editor

DEAR SIR,—In the discussion on the Paper by James Carr, Mr. Restall (Stalybridge) remarked that to sell coke for domestic use, consideration would have to be given to the elimination of "fliers," and suggested that with the coal supplied nowadays there would always be "fliers."

I would ask him to refer to the discussion on Mr. Hodsman's Paper given at the 5th Autumn Research Meeting of the I.G.E., *Transactions* 1933–34, p. 448. I was able to give the results of an investigation which showed that "fliers" were due solely to the method of quenching. Shock cooling of coke with water which sets up strains and stresses in the coke produces "fliers," while, on the other hand, slow quenching with steam or inert gases such as occurs in a steamed vertical or a Sulzer plant produces a silent burning fuel.

This happens irrespective of the shale or other extraneous matter present in the original coal; in fact, a "lively" coal after carbonization and slow cooling will produce a silent burning coke.

I would add that I am in entire agreement with Mr. Restall when he insists that the elimination of "fliers" is absolutely necessary if we are to develop a domestic market for coke.

17, *Thorn Lane*,
Leeds 8.
Nov. 29, 1943.

Yours faithfully,
F. FIRTH.

Co-operative Planning by Gas and Electricity

DEAR SIR,—The "Report on the Planning of the Gas Industry" of the British Gas Federation has been followed to-day by the Reconstruction Memorandum of the Incorporated Association of Electric Power Companies, which—with the Provincial Electric Supply Association and the London Electricity Supply Association—represents 40% of the output of electricity, the remaining 60% being supplied by municipal undertakings mostly belonging to the Incorporated Municipal Electrical Association.

There are remarkable similarities between the two documents, particularly in their opposition to nationalization and their support of the ordered integration of undertakings. This suggests, in the words of Virgil, that "whatever the issue, we share one common danger, one safety." Would it not be possible, therefore, for the two industries to explore the position together, with a view to reaching agreement and making united representations as to the future structure of both?

Even if—owing to the apparently irreconcilable support by municipal undertakings of the ownership of all public utilities by local authorities —such immediate co-operation would have to be limited to companies, there might follow general collaboration in the many reconstruction problems which are not the subject of controversy between company and municipal undertakings.

Nov. 30, 1943.

Yours faithfully,
"BLUEPRINT."

INTEGRATION IN THE SWINDON DISTRICT

At a time when consideration of the subject of integration is uppermost in the thoughts of the Gas Industry and, as responsible circles outside the Industry recognize, is an inevitable development, it is interesting to turn for a few minutes to what has been achieved in the Swindon area ; and we hope that a few notes will vindicate our conclusion that the whole plan of development there has been carried out on sound economic and engineering lines and promises much for the future. It is not a grandiose scheme, but it is not, we suggest, any the less interesting on that account. It seems to us, after going into the details and touring the area, that it provides an excellent example of grouping, imaginative in conception and financially reasonable in execution—and the main point is this, that the consumer, industrial and domestic, urban and rural alike, has benefited. The ground has been prepared for post-war progress, and the originator of the scheme, Mr. C. H. Chester, Managing Director of the Company, can look back with satisfaction and forward with confidence.

First Steps

The story stretches back twelve years—to 1932, when Mr. Chester took up his duties with the Company, examined the then existing situation, planned, and acted. A house in order—and not only the retort house—was the first step. The works were old, and they were not in a pretty state of repair. The distribution system left much to be desired. The sales and service organization, judged by modern standards, was meagre. Mr. Chester set to work. His proposals for improvement in the works and on the district called for expenditure. Load extension in face of keen and growing competition from electricity called for better consumer service and, quite definitely, lower gas prices. Convinced that sales would increase by leaps and bounds if gas was offered at prices thoroughly competitive with other fuels, and that expenditure on works and district would be covered by expanded output, Mr. Chester modernized his works, overhauled his distribution system, the while introducing attractive tariffs, both industrial and domestic. Development over the years has justified his belief. In a nutshell, output has quadrupled, while capital expenditure per million cubic feet of gas sold has been halved. Mr. Chester goes forward on a rising curve, and whatever the vicissitudes of the future, he stands firm in the knowledge which breeds confidence—the knowledge that his works are up to date, for improvements have been continuous, that his distribution system is sound and adequate, that his sales and service policy is appreciated by the consumer, that the demand for gas under those conditions is insistent.

Truly Rural

Gas is now used in the cowsheds, in the cottages of the agricultural labourers, in manor houses in the wilds of the country—thanks to a high-pressure supply. Country bakeries use gas. Country fish-fryers, when they can get the fish, use gas. The high-pressure mains go through country lanes and along country roads, picking up rural dwellings *en route*. And it is surprising how many dwellings there are away from the beaten track, nestling in hollows, hidden by trees. The countryside comprising the Swindon Company's district—part in Wiltshire, part in Gloucestershire, part in Berkshire—is very lovely. We lived for some time at the foot of the historic Kennett Avenue which leads its monolithic way to Avebury. We should have been better pleased had we had a gas supply. But Mr. Chester's plans envisage the running of a main along the Avenue, linking up with a modern gas service what was once the Capital of England. Those living around the sacrificial mound will soon, we hope, be able to enjoy this service—and within their means.

Fait Accompli

Let us glimpse Swindon's *fait accompli* in integration. In 1932 the gas outputs in the villages and small towns near Swindon which had a gas supply were more or less static; there was little, if any, sales service. The Swindon Gas Company looked outward. In 1933 an Order was obtained authorizing the extension of its limits of supply. The programme was fulfilled of extending the mains from Swindon, picking up hamlets and villages on the way, taking in Chiseldon. The following year saw the granting of a further Order extending the supply limits to Bishopstone, South Marston, Liddington, Stanton Fitzwarren, Wanborough, Blunsdon, Lydiard Millicent, Lydiard Tregoze, Ogbourne St. Andrew, and Ogbourne St. George. What delightful names, and what delightful hamlets! The process of coalescing continued. In 1935 a small holding company, the Swindon and District Gas Corporation, Ltd., was formed. Then came the purchase of the Marlborough Gas Undertaking (statutory) and the non-statutory undertakings at Wooton Bassett, Highworth, Fairford, and Farringdon, and later the statutory undertaking at Cirencester. In 1937 another Order was obtained to cover further villages and hamlets which, with the companies already purchased, made a homogeneous whole and gave the Company a large rural area to develop. Largely completed, this development stage would have been finished had not the war intervened. Two dozen villages were added, again charming villages having charming names.

Development was by high-pressure mains radiating from Swindon very much in the form of a spider's web, taking in the villages, not for destruction, however, but to afford them modern heat service on tap. As manufacturing units the local rural works were closed down, and in their place are holder stations supplied from a modern works where the quality of gas made is constant, where a sales and service organization had been built up. This organization was extended to include the subsidiary undertakings, which rapidly showed signs of growth, and in point of fact, more gas is now sold in the rural areas than in the district of Swindon itself. It was in 1937, too, that a still further Order was granted enabling the Marlborough Company to extend its boundaries for a final link over the Downs, through the various hamlets, to Wooton Bassett.

The Plan Ahead

And the final picture of this self-contained integration plan? Mr. Chester looks to the time when Swindon will supply, in addition to Swindon itself, the towns, villages, and hamlets, in an area for the most part rural, covering over 500 square miles—a plan which surely should meet with the blessing and approbation of the members of Lord Justice Scott's Committee on Land Utilization in Rural Areas, which reported just over a year ago. A plan, too, calculated to strengthen the Gas Industry and build up its prestige.

Diary

Dec. 11.—Scottish Junior Gas Association (Eastern District): Meeting with Western District, Glasgow. Address by Colonel C. M. Croft.
Dec. 13.—Gas Companies' Protection Association: Meeting of Committee, 5, Victoria Street, S.W. 1, 2.30 p.m.
Dec. 14.—B.C.G.A.: Publicity Committee, Gas Industry House, 10 a.m.
Dec. 14.—Federation of Gas Employers: Central Committee, Gas Industry House, 11.45 a.m.
Dec. 14.—National Gas Council: Central Executive Board, Gas Industry House, 2.15 p.m.
Dec. 15.—British Gas Federation: Council, 3 p.m., followed by Annual General Meeting, Gas Industry House.
Dec. 15.—London and Southern District Junior Gas Association: Meeting at Gas Industry House. Paper by Mr. L. Muir Wilson.
Dec. 15.—National Federation of Gas Coke Associations: General Committee, Gas Industry House, 10 a.m.
Dec. 16.—B.C.G.A.: Executive Committee, Gas Industry House, 12.30 a.m.
Dec. 20.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.

Ministry of Fuel and Power

Mr. J. EATON GRIFFITH, O.B.E., has been appointed a Principal Assistant Secretary in the Ministry of Fuel and Power, and will occupy the position of Chief Administrative Assistant to the Controller-General, Dr. H. S. Houldsworth, K.C.

Wakefield Joins U.K. Gas Corporation

The offer made by the United Kingdom Gas Corporation, Ltd., to purchase the Ordinary and Maximum Stock of the Wakefield Gaslight Company has been accepted to the extent of 96.61% of the Ordinary Stock and 96.78% of the Maximum Stock. The prices paid were 115 for the Ordinary Stock and 110 for the Maximum Stock, to be satisfied by the allotment of fully paid £1 Ordinary Shares of the Corporation.

The purchase has involved the allotment of 231,141 Ordinary Shares of the United Kingdom Gas Corporation in which permission to deal has been given by the Stock Exchange, London. This increases the issued capital of the U.K. Gas Corporation, Ltd., to £4,085,036, of which the Ordinary Shares issued comprise £1,481,112.

For Over 12 Years Messrs. Baird & Tatlock (London) Ltd., whose administrative headquarters are now at "Halidon," Claremont Lane, Esher, have published the *B.T.L. Bulletin*, dealing with the latest developments in laboratory equipment. In sending us the latest issue they state that owing to the paper situation this may well be the last while the war continues, but they hope to resume publication as soon as circumstances permit.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

GAS BOARDS

A Review of what has been so far achieved in the Integration of Municipal Undertakings

A THIRD of the total output of gas in Great Britain is produced in municipally owned gas-works, which, on the basis of the number of separate undertakings, represents a little over a fourth of the total (268 out of 1,079 to be exact, according to the latest available statistics). The Planning Report presented to the Minister of Fuel and Power last month pointed out that the general transfer of company undertakings to municipal ownership, or *vice versa*, would of itself solve few, if any, of the integration problems of the Industry. On the other hand, the Association of Municipal Corporations has declared itself in favour of the municipalization of all public utilities. Whatever may be the outcome of these views, it is established that ownership alone has no relation to the degree of efficiency of undertakings.

Local authorities, as well as companies, have recognized that some undertakings are too small to function efficiently and economically, and have either carried out integration schemes themselves or facilitated company grouping. Developments have taken place in each of the following ways:

Extension of mains to outlying areas.

Absorption of surrounding municipal and/or company undertakings.

Transfer to company ownership of undertakings capable of fitting into company grouping schemes.

Joint ownership by groups of local authorities and operation through elected Joint Gas Boards (of which there are now five).

"Ratepayer" ownership is, with one exception, confined to county boroughs, boroughs, urban and rural district councils. The exception is Lanarkshire, where the county council has purchased a number of undertakings in the county, and these have been amalgamated into a single unit for the purpose of administration. The two largest gas-works, at Uddingston and Cambuslang, have been maintained, and the several supply areas are fed from these. The organization does not cover the whole of the county; indeed, two major municipal undertakings, Motherwell and Hamilton, operate independently within the territory covered by the county council's undertakings.

Many of the larger municipal undertakings have attained their present size by amalgamation of smaller surrounding concerns, Huddersfield being a notable example. The Corporation has of recent years taken over several small undertakings, from both local authorities and companies, and supplies an area extending for several miles beyond the confines of the Borough. This expansion has facilitated a planned policy for the closing of small and expensive works, and for the greatest use being made of the capacity of the larger and better-placed plant.

In the last decade a substantial number of smaller municipal undertakings have been transferred to company ownership, chiefly to holding companies, which have been able either actually to link them up with nearby works, or to extend to them the advantages of centralized administration and improved technical direction. When the United Kingdom Gas Corporation acquired the Radcliffe, Farnworth, and District Gas Board it made provision for the representation on the company board of the six local authorities in whose areas the company supplies gas, and a similar principle was continued when, on taking over the Morley Corporation undertaking, a directorial seat was found for a representative of the local authority.

When large municipalities have actually acquired smaller neighbouring undertakings there has been no need to set up joint gas authorities, so that the fact that there are not more than five such boards does not fully reflect the extent to which integration has progressed. The five Joint Gas Boards now in operation, with year of formation and comparative annual outputs (in million cu.ft.) at the time of formation and in the latest year for which statistics are available for publication, are:

Accrington District Gas and Water Board (1894); 240; 570.
Buckhaven and Leven Gas Commissioners (1922); 81; 182.
Stretford and District Gas Board (1922); 518; 1,463.
Swinton and Mexborough Gas Board (1911); (1911 output figures not available); 948.
Wath, Bolton, and Thurnscoe Gas Board (1908); 56; 100.

Accrington

The Accrington Board was incorporated to acquire the gas and water undertaking of the Accrington District Gas and Water Company. Eight members are elected by the Accrington Borough Council and two each by the Church, Clayton-le-Moors, Great Harwood, and Rishton Urban District Councils, and the 25 sq. miles supplied with gas cover these areas, the township of Altham, and a small part of the Borough of Haslingden. Whalley and part of Billington were added in 1924, and Wiswell in 1934. Up to 1922 gas was made at Accrington and Great Harwood, the district mains through the different townships being intercoupled, but this was an unsatisfactory arrangement owing to the varying pressures, quality, and composition of the gas supplied from the two works. Following the appointment of Mr. A. J. Harrison as General Manager in 1918, gas manufacture was centralized at Great Harwood, and the Accrington works was retained for storage, the holders being fed by a high pressure main direct from Great Harwood. When the area of supply was extended to Whalley, a branch was taken from the high pressure main to supply a new district holder there, and Billington and Wiswell were supplied from this source. In 1928 the Board completed negotiations for taking crude gas from local coke ovens, and for some years the whole of the requirements were taken from that source, until it became necessary to buy bulk supplies from Blackburn and Oswaldtwistle.

The Board's declared calorific value is 450, the colliery contract calling for 460, and this is kept remarkably constant, enabling the Board to distribute gas of uniform quality and pressure. Notwithstanding a greatly increased demand, complaints of poor or insufficient supply are now practically non-existent. Gas sales are more than twice as great as in 1894, and with the competitive price charged it is anticipated that post-war industrial demands will at least equal those of wartime. The purchase price of the gas undertaking was £342,450, and loan sanctions have since amounted to £312,377, making a total of £654,827, but the present net capital indebtedness is only £136,525. Annual standing charges per thousand cu.ft. are only half of 20 years ago. Over half the sales are industrial, and over one-third are through prepayment meters. Water distribution covers a large part of the Board's activities, and experience has shown advantages from this joint control, particularly as regards distribution and accountancy. On the distribution side both jobs are undertaken by the same staff and workmen under one distribution superintendent, and similar arrangements apply to accountancy work on rentals and general clerical work. Drawing office and laboratory work is also undertaken jointly. There is a district office and workshop in each township, with resident staff for the joint services. There has been perhaps one disadvantage in the general linking up of districts, and that is the original capital cost of long lengths of non-productive mains, but this is inevitable in any linking-up scheme, and it is outweighed by the many advantages, particularly where towns inter-connect as in that part of Lancashire.

Buckhaven and Leven

The Buckhaven and Leven (Fife) undertaking is owned jointly by the Burghs of Buckhaven-and-Methil and Leven, and, of the 11 Gas Commissioners, seven are appointed annually by Buckhaven and four by Leven. There were formerly two separate gas companies, whose undertakings were compulsorily acquired after protracted arbitration proceedings by the Buckhaven Town Council and afterwards transferred to joint ownership. The Buckhaven plant was inadequate, and modified extensions were required at Leven, and after exploring alternative schemes the Board concentrated production at Leven and installed compressing plant and a high pressure main to join up the two works, and provide *en route* a supply of gas to augment the supply in those areas most seriously affected. The two works having been linked, the strain on the plant at Buckhaven was relieved by utilization of the margin of retort plant available at Leven, and greatly improved working results were achieved. Showrooms and workshops were built in each of the areas of supply, sales rose rapidly, and many further extensions have been carried out to keep pace with the demand. The difficult financial circumstances of the undertaking at the time of amalgamation necessitated a policy of conservative capital expenditure, and a scheme of gradual expansion in preference to a large initial outlay.

Since the undertaking came under joint municipal ownership, with Mr. H. A. Aitken as Engineer and Manager, gas sales per annum have increased by more than 150%, maximum daily output by 124%, and mileage of mains by 73%. Centralization costs were more than £58,000, but outstanding debt has been reduced from £95,160 (£517 per million cu.ft. of gas sold) to £60,109 (£285 per million cu.ft.), the latest revenue account showed a balance of £15,612 against a deficit of £6,787 in the first year, and the price of gas to ordinary consumers has dropped from 7s. 1d. to 3s. 6d. per thousand cu.ft.

Stretford and District

The Stretford Gas Undertaking had existed for nearly 70 years before the creation of the Stretford and District Gas Board in 1922. The old Stretford Gas Company had powers to supply gas in seven districts in Lancashire and three in Cheshire, but it never exercised its

rights in Timperley (now served by the Altrincham Gas Company), and in 1906 the Chorlton-cum-Hardy area was transferred to the Manchester Gas Department. In 1921 the Manchester Corporation bought the Stretford undertaking, but Parliament ruled that if the local authorities affected, or any two of them, decided to acquire it, Manchester should sell it to them at the price they had paid for it. The Stretford, Sale, and Ashton Urban District Councils, and the Barton and Bucklow Rural District Councils, exercised this right and appointed the Joint Gas Board, to which the undertaking was transferred after being operated by Manchester for nine months. Since then there have been various alterations and amalgamations of the constituent authorities, which now comprise the Boroughs of Stretford and Sale, and the Urmston Urban District Council, but the area of supply is unchanged. The 211 miles of main cover about 17½ sq. miles, including the whole of the industrial area of Trafford Park.

Extensions and additions to the works, under the management, first of Colonel W. M. Carr, and afterwards of Mr. James Carr, have resulted in the maximum daily output being nearly trebled, and total annual sales have risen from 518 million to over 1,460 million cu.ft. according to latest available statistics. When the war started, the Board was making continual progress with the domestic user and very rapid progress with the industrial user, and was displacing fuel oil in most of the Trafford Park works.

Members of the Board are nominated by the constituent authorities in proportion to the amount of gas sold in each area. The operation of the Board has been very successful and it has not been subject in any way to local politics. It is hoped that after the war new industrial loads will more than offset the discontinuance of war industries. Stretford was one of the first undertakings prior to the war to link up in a big way with neighbouring undertakings, and although there is no interchange of gas under normal conditions, the linked-up mains have operated very successfully in emergencies.

The Two Yorkshire Boards

The formation of the Swinton and Mexborough Gas Board did not represent any form of integration. The one undertaking serving the two adjoining urban districts of Swinton and Mexborough, formerly owned by the Swinton and Mexborough Gas Company, was purchased jointly by the two local authorities by arbitration, and carried on very much as it was before the change of ownership.

The undertaking of the Wath-upon-Dearne District Gas Company was acquired by the Wath-upon-Dearne and the Bolton-upon-Dearne Urban District Councils by mutual consent, and eight years later the Thurnscoe Urban District Council was given representation and joint ownership, the Board at that time comprising six members from Wath, four from Bolton, and two from Thurnscoe. Since that time the Bolton and Thurnscoe local authorities have amalgamated to form the Dearne Urban District Council, so the Gas Board now has six members from Wath and six from Dearne. Consumers have increased from 4,322 to 9,600, and gas sales from 56 million to over 100 million cu.ft. per annum. Gas production was discontinued in 1919 when the Board agreed to purchase crude gas from a nearby coke oven plant, and thus became one of the first gas undertakings in the country to retail coke oven gas. On its way to the Board's works, the crude gas main passes certain works, and advantage was taken to afford a supply *en route*. The area of supply is 11½ sq. miles, with 50 miles of main. Most of the consumers are coal miners, whose allowance of home coal has a big effect on the consumption per consumer figure, which stands at about 12,300 cu.ft. per annum. To encourage the use of gas, the Board offers a two-part tariff, with a service charge of 10s. per quarter and a commodity rate of 5.4d. per therm. Further, standard charges are arranged on the block charge system.

THE MECHANISM OF CARBONIZATION IN CONTINUOUS VERTICAL RETORTS*

By Dr. A. E. HAFFNER and Dr. F. R. WESTON

Gas Light and Coke Company

FOR many years the Staff of our Company has been interested in studies of continuous vertical retorts, particularly when carbonizing Durham run-of-mine coal. The properties of such coal are not so favourable for smooth travel as those of nut coal or coal from some other fields. Any developments of design or operation, however, to overcome these imperfections may be applicable to the carbonization of more smoothly travelling coal, where the difficulties occur to a minor degree or may even not be recognized. In the art of carbonization in vertical retorts there has accumulated throughout the Industry a wealth of experience and operational skill, but the basis of this is mainly empirical. Designers have made rapid progress since the introduction of continuous vertical retorts, but many questions have to be answered if progress is to continue at the same rate. This development work has been handicapped by the lack of visual evidence of the nature of the charge, which is clearly to be seen in intermittent systems at the end of carbonization. It was felt that a new stimulus to process technique and design would follow from a discovery of the nature and structure of the inner charge of the retort while working. Shock cooling of working retorts by spraying the combustion chambers with water was therefore undertaken in an attempt to preserve the charge in its typical working state. The present Paper is concerned with the "post-mortem" examination of "frozen" charges inside four Glover-West retorts.

The facts and evidence collected are not necessarily applicable to other types of retort, and it is realized that the value of the data gathered together would be more than doubled by repeating the same experiment upon another installation of retorts. Naturally this can be done only on retorts which are due for demolition, but as the opportunities arise the work will be extended. Should any other company have retort settings about to be demolished and would like to quench one or two retorts to add to the pool of knowledge, our Company would be happy to co-operate. Until the evidence is considerably widened the pitfalls of premature conclusions are to be avoided, and this Paper is concerned with marshalling the first series of facts rather than drawing inferences from them.

Quenching and Dismantling the Retorts

The first opportunity of quenching some retorts was taken, but though the cooling was effectively carried out, subsequent inleakage of air ignited the charge and destroyed all useful evidence. With extra precautions the cooling was next carried out on another installation with sufficient success to justify presenting the results to you. This installation consisted of bell-bottomed Glover-West retorts, which has been particularly successful in the carbonization of Durham run-of-mine coal throughout a long life of 3,500 working days. During this period part of the retorts had been reset once and the settings had been let down on alternate summers on nine occasions. The results of three carbonizing tests carried out at various times during the period are given in Appendix 1. The retorts were oval and expanded with uniform taper in both major and minor axis to 20 ft. down, followed by the West's steaming chamber. The retorts were heated by five horizontal single-stage combustion chambers from which the waste gases passed through five more horizontal circulating chambers before leaving the setting. The isometric drawing in fig. 1 [which will be published in next week's "JOURNAL"] indicates the general arrangement of the setting. The four retorts selected were the best row of four in the house, and special care was taken to see that they were operated normally in respect of rodding and speed of extraction for a considerable period before the quenching.

Water was supplied to a vertical manifold which had branches, cocks, and unions facing the inspection plugs of the five combustion chambers on each side of the selected retorts. To the unions could be attached 10 ft. lengths of ¾ in. gas barrel drilled at regular intervals with ⅛ in. holes. At zero hour the extractors were stopped, the settings isolated from producers and waste heat boilers, inspection plug blocks removed, and into No. 1 chamber a 10 ft. length of the sprinkler tubing was inserted, the union tightened, and water immediately put on.

It was interesting to observe that as the water impinged on the white-hot walls, steam was generated so violently that a temporary pressure was set up which stopped the water until the pressure subsided. A cycle was thereby set up of water flow, steam pressure, water stoppage, release of pressure and water flow. Steam was leaving the combustion chamber so violently that it was wellnigh impossible to insert the next sprinkler. Water was therefore shut off for a brief moment at a distant master cock until the next sprinkler could be inserted. In this step-wise manner ten of the sprinklers were finally at work inside the combustion chambers, supplying water at a rate of about 10,000 gallons per hour.

In an hour the combustion chambers were cooled from 1,350° to well below red heat. It was expected that the circulation chambers would have been cooled by the passage of the large volumes of steam, but it was disappointing to find that they took six hours to reach black heat. It was an error not to have provided sprinklers for the circulators as well. This meant that the cooling was not rapid enough in the upper part to prevent carbonizing proceeding to completion, and most of the evidence of the structure of the upper part of the charge was lost. The lower half had cooled more rapidly than we

* Paper to the Southern Association of Gas Engineers and Managers (Eastern Section), Nov. 26.

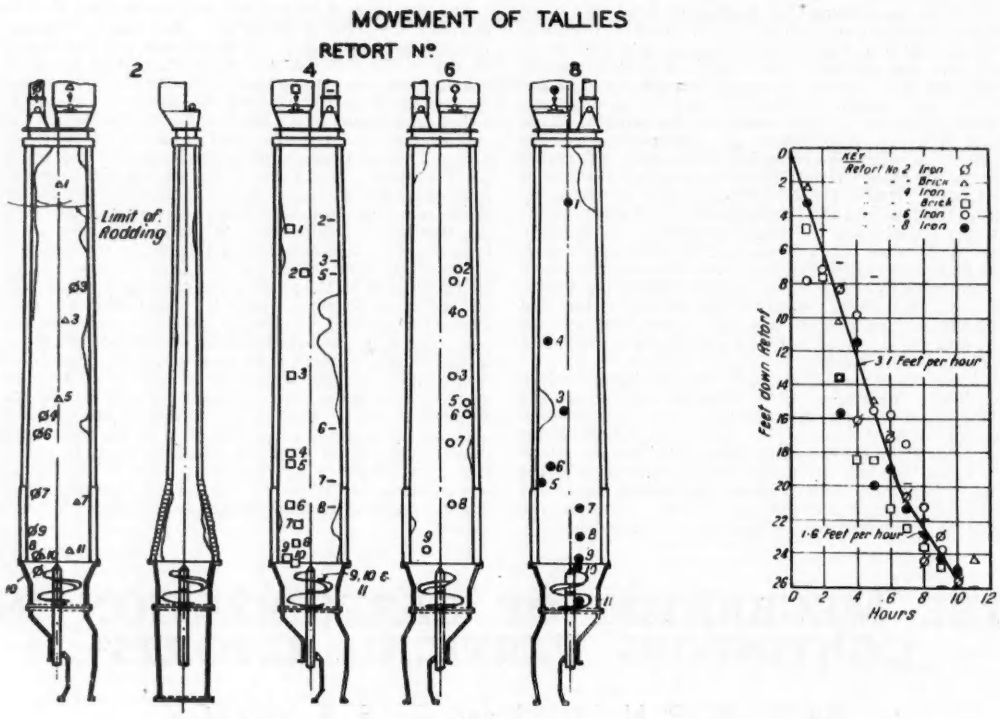

FIG. 2.

had hoped, and the charge was more nearly preserved in its working state. As a precaution against ignition of the charge through air inleakage the retorts were kept under pressure with supplies of steam *at top and bottom*, and later, water was also run down the offtake pipes into the retorts themselves.

Although provision had been made for cooling no more than two retorts, the third and fourth retorts sharing the same combustion chambers were cooled almost as rapidly, and these were dismantled first to enable us to establish a technique before tackling the specially cooled retorts. Throughout the dismantling it was amazing to find how little affected brickwork had been by its drastic treatment.

The procedure finally adopted was to measure the dimensions of retort inside and out, scurf thickness, and fissures and voids at each floor-tile level (approximately at depth intervals of 2 ft.). These were supplemented with photographs of the plan and side elevation at each of these levels. Numerous samples of coal, semi-coke, and coke were taken and typical analyses are recorded in Appendix 2. In specially interesting cases, the whole cross section of the charge was taken out for the determination of block density.

Evidence from the Movement of Tallies

To provide indication of movement in the descending charge a number of tallies were prepared for periodic introduction into the retort. These tallies were made either of pieces of soft Ewell brick in which numbers were deeply carved, or of short lengths of ½ in. gas barrel numbered in Roman numerals by means of saw cuts. For twelve hours before quenching the retorts the tallies were slipped under the rodding balls immediately after the hourly rodding. In this way, possible disturbance of the positions of the tallies by being struck by a rod was minimized. In two retorts tallies were inserted at the central rodding ball as well as the one on the offtake side in order to establish whether there was relative movement of the outside and central portions of the charge.

The dismantling of the retorts and the disinterring of the charge were enlivened by the periodic discovery of a tally, which was then plotted on the charts of the cross sections. A few of the tallies had passed right through the retort in twelve hours, one or two were in the coke box or extractor worm, a few were never found and the rest were in the charge itself.

The tallies therefore provided a time scale fixed in the charge. A still further improvement would be to make the tallies of numbered bolts on which could be placed washers of zinc, tin, lead, and copper, the fusion of which metals would provide a temperature history.

The positions of these tallies are shown in fig. 2, and the following conclusions can be made:

(1) The tallies descend in approximately vertical lines from the point of insertion.

(2) The rate of descent is not regular, the tallies not being quite equally spaced. Indeed some of them have overtaken the tally which set off an hour before, but it is believed that this unnatural behaviour can be explained by the fast tally being hit during rodding, the influence of which would be felt 6 ft. 6 in. from the rodding balls.

(3) A comparison of the rates of descent of the central tallies and the offtake side tallies shows an interesting case of irregularity of travel in the case of No. 4 retort and a special section will be devoted to this. Otherwise the centre of the charge does not appear to travel faster than the outside.

(4) The charge appears to take 6½ hours to reach the top of the steaming chamber and almost four hours to pass through this chamber. All the tallies are plotted on the composite graph, and indicate that the mean rate of descent is 3.1 ft./hr. in the retort proper and 1.6 ft./hr. in the bell.

The mean rate of supply of coal into the retort, as determined by the known throughput, the bulk density of the coal and the cross-sectional area at the top of the retort is 3.0 ft./hr., while the inclined plane of the extractor worm also descends at 3.0 ft./hr.

Whatever may happen in other types of retort, it does appear therefore that in this case the expansion of the charge on changing from coal to coke takes place wholly in a horizontal direction. Another fact which seems to support this idea is that the density of the block of coke just above the steaming chamber—a block which substantially occupies the whole of the cross section of the retort—is somewhat higher even than the figure calculated from the increase in area of the retort alone. If both vertical and horizontal expansion of the charge had occurred, then a lighter coke would have been formed.

(To be continued.)

The Gas Supply Company, Ltd., of Melbourne, has declared a dividend at the rate of 3½% for the half-year ended June 30, 1943, making a total for the year of 3½% actual. Profits for the year were £12,371, against £11,947 for the previous year. During the first half of the year the areas served by the company in North Queensland commenced to recover, and towards the end of the year the demand for gas increased rapidly. The costs of supplying gas under the conditions operating in the North also increased considerably. Total gas sales at all branches increased by 17.2%.

BENZOLE PLANT OPERATION

By A SCOTTISH GAS ENGINEER

IN a recent Paper a Gas Engineer in Scotland described the operation of a benzole plant installed at his works. He explained that great benefit came from economy of steam due to the addition of an oil/oil heat exchanger, and overhaul of the steam engine. Up to this time, he continued, our steam consumption per gallon of benzole amounted to 130 lb. approx., while now we are down to approx. 70 lb. per gallon benzole. Taken over last year's make, a saving of something like £300 per annum in production costs is fully expected. In practice we find that the oil inlet to the heat exchanger is approx. 15°C., and the outlet 75°C. approx., giving an additional preheat of 60°C. The temperature at inlet to still is now 120°–125°C., and an appreciably improved stripping of oil is being obtained.

A two-pen recorder has given the duty expected; the value of these instruments is beyond question for plant control. To my mind they are essential equipment for very many points on the works if proper technical control is to be exercised. Change over to chain drive has also been worth while, as short of direct coupling, this is the most positive type of drive. It was feared that the drive would be noisy, and after the first week our fears were realized. The cause was found to be faulty lubrication, and in place of a single drip pipe to each chain twin pipes were made dripping oil into each side of the chain. The chains run in a sheet metal case which was allowed to fill with oil until the chains at their lowest points just broke the surface, ensuring efficient lubrication. No further trouble from excessive noise has resulted to date, and the life of the chain in consequence will be lengthened.

A centrifugal pump installed to boost water pressure has also worked successfully, and we now have a pressure of 25–30 lb. per sq.in. available at ground level, and this is more than ample for our requirements.

The automatic controls have not given complete satisfaction to date, not due to any inherent faults in the apparatus itself, but rather to local conditions. The position is as follows: The controls are of the well-known Arca type. In this case an oil tank is provided equipped with an electrically-driven centrifugal pump to supply oil at a pressure of approx. 45 lb. per sq.in. as the operating medium. These automatic valves have been installed at three points—viz.:

1. Dephlegmator head—controlling temperature at top of fractionating column.
2. Rack cooler—controlling temperature of return oil to washer.
3. Steam to still—acting as a stop valve when required.

Items 1 and 2 require no further explanation except, perhaps, to state that (1) above replaced an existing control and serves to give any desired quality of benzole within the range of the plant, and in the case of (2) it is considered essential for best results to keep the temperature of the return oil to washer 2–3 degrees above the temperature of the gas entering the washer. This control maintains any desired temperature.

No. 3 requires a little further explanation. Trouble has been caused due to a seal blowing with the subsequent loss of benzole. Should this happen, the usual procedure is to shut off the steam supply to the still until the seal either makes up or is made up. One result of losing the seal is that the naphtha pipeline to the storage tank will heat up due to the escape of steam from the fractionating column into the collecting vessel. Accordingly, a thermo-relay was fitted in this pipeline, close to the collecting vessel, and this controls a valve inserted in the steam line to the still. Should the seal now be lost for any reason, the steam supply to the still is automatically shut off by the valve, and on resumption of normal conditions the valve opens again automatically.

In practice the arrangement can work perfectly. However, one or two "teething" difficulties have arisen, though these, I am sure, will be overcome in the near future. Firstly, the system is new, and the operation of the valves, although simple, is not readily understood by the ordinary type of labourer. Normally little attention is required, but trouble has been experienced due to dirty water—*i.e.*, the works water which is pumped from the adjacent river naturally contains varying amounts of vegetable matter, and this, due to imperfect filtering, chokes the ports of the water valves, consequently causing the loss of seal and the automatic shutting down of the plant. This, for some obscure reason, usually happens at night. Another source of trouble which has the same effect has been due to air pockets collecting in the oil pressure lines, thereby causing the valves to become inoperative again. However, there is little doubt that these are ephemeral troubles and steps are already being taken to effect a cure.

Benzole production should be at the expense of calorific value. When first I started to collect some material for this Paper I remembered that, in the past, the effect of benzole recovery had been likened to the increase in load brought about by a large industrial consumer. I thereupon compiled a statement showing the comparison between the two cases. The figures used in arriving at the calculated results are those generally accepted. The result, as you can see from Appendix 2, is very much in favour of benzole. The assumptions are that an undertaking produces 2,250,000 therms of gas per annum, that benzole recovery is then started, but the retort house calorific value is kept at the former value of 450 B.Th.U. per cu.ft., and that two gallons of benzole are recovered per ton of coal. In order to maintain the same thermal output, additional coal has to be carbonized. Should this additional coal have been used to produce gas of a calorific value of 450 B.Th.U. in place of benzole, the additional volume of gas, if sold in bulk, would yield a certain revenue. Against this income the value of the benzole is taken out, due corrections having been made for working costs.

Appendix 3 gives the balance-sheet for benzole production. This method is the one used to assess the value of benzole production each year. Every attempt has been made to take a reasonable view of the position; all possible credits have been allowed, while all charges which could be fairly debited to benzole have been debited.

It should be noted that the expenditure given under time and materials in the balance-sheet includes some £350 spent on the overhauling of the plant, and this sum will not recur in full in following years, while a very substantial saving in steam consumption has been effected almost from the beginning of the present financial year. This saving, as already stated, is approximately £300 over a full year and will continue. It would appear, therefore, that, with the present ratio of coal/coke values, a substantial balance approaching £1,200 in favour of benzole recovery can be anticipated next year.

APPENDIX 1.

EFFECT OF DETERIORATION OF COAL QUALITY ON GAS YIELDS AND BENZOLE RECOVERY.

	1937-38.	1938-39.	1939-40.	1940-41.	16.5.41 to 31.12.41.	Actual C.V.=425 16.5.42 to 16.9.42.
Gas made per ton of coal (cu.ft.)	17,385	16,525	15,501	14,973	14,583	15,264
Do. do. (therms)	78.23	74.36	69.75	67.38	65.91	64.87
Benzole recovered gall. per ton...	—	1.205	2.27	1.90	1.35	1.84

APPENDIX 2.

CALCULATED RETURNS FROM A WORKS PRODUCING 2,250,000 THERMS PER ANNUM WITH AND WITHOUT BENZOLE RECOVERY. CALORIFIC VALUE OF GAS AS MADE REMAINING CONSTANT.

	No benzole recovered.	Benzole recovered.
Gas produced	2,250,000 therms	2,250,000 therms
Calorific value at inlet to holder	450	434
Gas made per ton of coal ...	16,400	16,320
Benzole recovered per ton of coal	—	2 gall.
Therms per ton of coal as gas	73.8	70.8
Coal required	30,488 tons	31,780 tons
Additional coal	—	1,292 ,,
Benzole made	—	63,560 gall. or 95,340 therms
Gas yield from 1,292 tons coal...	95,350 therms	
Average price of gas (Industrial rate for this consumption) ...	5.573d. per therm	
Average price obtained per gall. benzole		16.79d.
,, cost of production per gall. benzole ...		3.39d.
Net receipts per gall. benzole...		13.40d.
,, ,, therm benzole		8.93d.

Total receipts from gas as above ...	£2,214.2
,, ,, benzole as above	3,548.8
Profit due to benzole extraction ...	£1,334.6

APPENDIX 3.

BALANCE-SHEET OF BENZOLE RECOVERY WITH EXPLNATORY NOTES.

1. Total therms manufactured	2,319,107 therms
2. Therms/ton coal carbonized	65.95
3. C.V. of gas sold	425 B.Th.U.
4. Total coal carbonized during year	35,167 tons
5. C.V. in retort house before benzole extraction ...	440 B.Th.U.
6. Therms per ton of coal if no benzole extracted ...	73.94
7. Total benzole made	66,089 gall.
8. Gallons of benzole/ton coal carbonized	1.88
9. Coal required if no benzole extracted...	31,366 tons
10. Additional coal carbonized for benzole extraction ...	3,801 tons
11. Average cost of coal per ton	32s. 4.7d.
12. Cost of additional coal	£6,156 0s. 8d.
13. Coke saleable per ton of coal carbonized in cwt. ...	7.34
14. Total coke saleable	12,906.3 tons
15. Coke saleable per ton of coal carbonized in cwt. if no benzole extraction	6.95
Note.—Figure used for above—0.21 cwt. coke/ton coal for each gallon of benzole recovered per ton of coal.	
16. Additional tonnage of coke produced	2006.9 tons
17. Average price of coke sold	42s. 5d.
18. Additional income from coke sold	£4,256 3s. 10d.
19. Gallons of tar per ton of coal carbonized	14.91
20. Tar due to additional coal carbonized 14.91 gall./ton	56,673 gall.
21. Net price of tar per gallon	3.13d.
22. Additional income from tar sold	£739 2s.
23. Cost of coal handling per ton	6.85d.
24. Additional annual cost	£108 9s. 9d.

25.	Cost of coke handling per ton	2s. 3.76d.
26.	Additional annual cost	£232 2s. 5d.
27.	Cost of maintenance of coal and coke handling plant (4d. per ton estimated)	£96 15s. 11d.
28.	Additional carbonizing plant required to process additional coal	3-5 ton retorts
29.	Approx. cost of additional carbonizing plant ...	£9,400
30.	Repayment on carbonizing plant over 20 years ...	£470
31.	Total interest on capital borrowed at 4% (20 years)...	£3,949
32.	Average annual repayment	£197 9s.
33.	Maintenance on carbonizing plant at 10d. per ton ...	£158 7s. 6d.
34.	Cost of benzole plant	£2,763
35.	Repayment over a period of 10 years	£276
36.	Total interest on capital borrowed at 4% (10 years)	£608 8s.
37.	Average annual repayment	£60 16s. 10d.
38.	Labour	£110 1s.
39.	Material	£477 5s. 11d.
40.	Steam lb. per gall. of benzole extracted	130
41.	Cost of steam at 1s. 6d. per 1,000 lb.	£644 7s.
42.	Water in gall. per gallon benzole extracted	55 gall.
43.	Cost of water at 1d. per 1,000 gall.	£15 2s. 11d.
44.	Gas oil make up 2,849 gall.	£146 0s. 4d.
45.	Cost of additional purification at 4d./ton coal ...	£63 7s
46.	Office and administration charges	£25
47.	Allowance for surplus steam due to reduced steaming	£78
48.	" " " surplus from producers	£166

Total gas made for year ended 16.5.43: 545,672,000 cu.ft.	=	2,319,107 therms
Coal carbonized	=	35,167 tons
Gas made/ton coal	=	15,517 cu.ft.
Therms/ton coal	=	65.95
Benzole recovered	=	66,089 gall.
	=	1.88 gall./ton

Allow 1,000 cu.ft./gallon benzole extraction per ton of coal carbonized for loss of gaseous volume.

∴ If no benzole extracted make/ton becomes
15,517 + (1.88 × 1,000) = 17,397 cu.ft.
∴ Tonnage of coal required to produce 545,672,000

$$= \frac{545,672,000}{17,397} = 31,366 \text{ tons.}$$

∴ Therms/ton coal no benzole extraction = $\frac{2,319,107}{31,366}$
= 73.93

Expenditure.	£	s.	d.
Benzole Plant—			
Repayment over 10 years ...	276	6	0
Interest on borrowed capital	60	16	10
Gas oil	146	0	4
Steam	644	7	0
Water	15	2	11
Wages	110	1	0
Materials	477	5	11
Electricity	3	0	0
Licence	1	0	0
Office and overhead charges	25	0	0
Additional coal carbonized	6,156	0	8
Cost of handling coal ...	108	9	9
" " coke ...	232	2	5
Maintenance on coal and coke handling plant ...	96	15	11
Additional Carbonizing Plant: Cost £9,400.			
Repayment over 20 years ...	470	0	0
Interest on borrowed capital	197	9	0
Maintenance of additional plant	158	7	6
Purification	63	7	0
Profit	630	10	7
	£9,872	2	10

Revenue.	£	s.	d.
Benzole sold	4,632	18	0
Income from extra coke	4,256	3	10
" " tar	739	1	0
Credit for surplus steam	244	0	0
	£9,872	2	10

£350 may be added to credit as cost of additions.

Chelmsford Gas Committee has approved a system, recommended by the Borough Treasurer, to meet difficulties experienced in the quarterly reading of meters in houses frequently left unattended, by which householders read their own meters.

The Newcastle-upon-Tyne and Gateshead Gas Company recently entertained a party of R.A.F. officers and men on the occasion of their paying a visit to one of the Company's works in the North-East. The visitors were the pilots, air crews, and ground staff (including one W.A.A.F. officer) of a famous night-fighter squadron who were anxious to ascertain how the Gas Industry was assisting in the war effort. The scheme originated in a desire to provide interesting visits for the air crews during non-flying periods, and it would appear that a continuance of such visits to factories engaged on important war work would be of great value to the Service concerned. The party were met by Mr. John F. Jackson (Secretary to the Company) and proceeded to the works, where Mr. G. E. Anderson (Works Manager) and his staff awaited them and conducted them on a tour of inspection. At the conclusion of their visit the party were entertained at luncheon at a works canteen and Mr. Jackson formally welcomed them. Wing-Commander Maxwell, in reply, said how interesting they had found all they had seen on the visit. Later, in the evening, the day's outing concluded with a visit to the Theatre Royal, Newcastle, where employees of the Company were the guests of the R.A.F.

HIGH PRESSURE GAS*

By T. A. TOMES,
Deputy Engineer and Manager, Stourbridge Gas Department

HIGH-pressure gas has assumed a new and vital significance in view of the prospects of distribution by this method over wider areas in post-war years. The system described became necessary at Walsall in view of continued development in the outlying district, and in particular the erection of one estate of over 3,000 houses. The policy was adopted of feeding the gas back from the outskirts to the centre of the town, and a route was carefully chosen with this in view, and so as to allow its extension around the remaining portion of the outlying districts of the Borough as the occasion demanded. Two 100,000 cu.ft. per hour compressors were installed, and provision was made for feeding an 8 in. high pressure main at varying pressures up to 40 lb. per sq.in., the pressure being reduced on entering the existing low pressure system by Reynolds type district governors.

For the purposes of placing contracts the work was divided into three sections, which were (*a*) Compressors, (*b*) Main and Mainlaying, (*c*) Governors.

Compressors

The gas compressors are of the reciprocating, two crank, steam driven, vertically enclosed tandem type. There are two machines, each having a capacity of 100,000 cu.ft. per hour against a gas pressure of 15–40 lb. per sq.in., and running at a speed of 340 revs. to not exceeding 380 revs. per minute at 70 lb. per sq.in. steam pressure. The horse power of the compressor varies between 146–198, depending on the load. They are governed by an automatic regulator being coupled to the throttle valve on the steam supply. There is an independent centrifugal governor provided, in order to prevent the compressor exceeding the maximum speed, and also an excess pressure valve which comes into operation if the automatic regulator fails to work. It was determined that it is unnecessary to work the compressor during the hours of 10 p.m. to 7 a.m., but since the Estate has only one source of supply (*i.e.*, the compressors) it is essential that the main be charged with low pressure gas during these hours. To accomplish this the loaded by-pass valve comes into operation—this being set to be balanced, so that when the compressor is shut off and the pressure in the high pressure main falls to below that of the gas-holder, then it opens and admits low pressure gas to the main.

The compressors are housed in a corner of one of the retort houses, since this was the most convenient position for making low pressure connexions, and also for leading off with the high pressure main from the works.

Main and Mainlaying

The Route.—When considering the route it was endeavoured to choose the shortest possible so as to keep the capital outlay and maintenance charges to a minimum, and also to select roads having the least traffic over them in order to reduce the liability to fracture, drawn joints, &c., and to facilitate the laying of the main and any repairs that may be needed later.

The Main.—This was of weldless steel tubing, the average length of each section being approximately 25 ft. with the ends prepared for a sleeve welded joint. In order to strengthen them against corrosion they were coated inside with boiled linseed oil, and outside with a special bituminous solution, and then double wrapped with jute cloth previously immersed in the same solution and afterwards whitewashed. The joints were oxy-acetylene welded and tested after completion to an air pressure of 65 lb. per sq.in. and carefully examined with soap and water. After testing, the joint was painted with best quality bitumen paint and double wrapped with hot impregnated hessian so as to make the coating absolutely impervious over the joint and homogeneous with the coating on the pipe.

Mainlaying.—The minimum depth of the main at any point was 24 in. below the surface of the roadway, measured to the top of the pipe, and 18 in. below the surface of the footway. At half-mile intervals the main was suitably earthed as a protection against electrolytic corrosion. As the main was laid, a mandrel was pulled through it to ensure it was free from obstructions.

Governors.—For the reduction of the gas pressure at the point where the high pressure main enters the low pressure system, Reynolds district governors were chosen as being the most suited to our purpose, as with this type of governor there is a very effective range of the rates of flow, liability to oscillate at low rates of flow is reduced to a minimum and the governor valves and ports are easily accessible. One set of 6 in. and two sets of 4 in. governors were purchased, each set being provided with inlet and outlet valves of the screw down disc type, complete with screen boxes, and installed in a welded steel kiosk.

Pulsation Tank.—A Lancashire boiler shell which had recently been replaced on the works was converted and utilized (approximately 150 yards from the high pressure main) as a pulsation tank or high pressure receiver, its main purpose being, as its name implies, to cut out the possibility that the gas pressure in the outlet main will pulsate due to irregularities in the delivery pressure.

* From a Paper to the Midland Junior Gas Association, a previous extract from which was given in the "JOURNAL" of Oct. 27.

Syphons.—The only syphons were installed on the inlet (low pressure) and outlet (high pressure) sides of the compressor, although the pulsation tank itself acts as a collector. The system was designed as the result of practical American experience—*i.e.*, that no trouble is experienced due to condensate when working over 8 lb. per sq.in. pressure, all water coming down in the compressor, first syphon, or pulsation tank. This has been verified by our experience to date, the system being worked at 15 lb. per sq.in. gauge pressure without any trouble whatever from this cause.

In order to ascertain the cost of distribution per therm it is necessary to know seven items—namely:

1, Amount of gas distributed through the system; 2, capital charge incurred; 3, interest payable on money borrowed; 4, allocation to sinking fund—*i.e.*, amount of money which must be set aside each year in order to repay the debt incurred due to purchase of new plant by the end of its estimated life. (Care must be exercised in the choice of what is a reasonable life to expect for the system. If too long a period is chosen, then new plant will be required before the old is paid for, while if the period is too short, then, since this allocation must be met out of revenue, an unnecessary burden is placed on the price of gas until it is paid for. It was considered that a life of 15 years for the compressor and 30 years for the high pressure main would be a reasonable expectation); 5, cost of repairs and maintenance of the system; 6, rates payable—with a company this is important, but with a corporation this is merged into a general assessment of the whole undertaking and therefore may be ignored; 7, running cost of the compressor.

Considering each of these items in turn, therefore, in 1937 we have the following results:

1. The *Quantity of Gas compressed* has a marked effect on the cost of gas distributed as is illustrated by the figures which follow. Unfortunately the advent of the war prevented our obtaining results anticipated, but this is, of course, unavoidable.

2. *Capital Cost* amounted to £15,085, being made up as shown in Appendix A.

3. *Interest.*—The interest on the capital charge incurred was 3⅜%, amounting therefore to £509 2s.

4. *Sinking Fund.*—When based on a 3% earning of the fund then—

£5.377 per annum will redeem £100 in 15 years.

£2.102 per annum will redeem £100 in 30 years, so that allowing a life of 15 years for the compressor and 30 years for the remainder of the system, then the allocation to the sinking fund will become—

23.5 × 5.377 = £126 7 0
127.35 × 2.102 = £267 14 0

Total . £394 1 0

5. *Maintenance and Repairs.*—It is considered that 1% on the whole of the high pressure system is sufficient to cover the item of maintenance and repairs—*i.e.*, £150 17s. per annum.

7. *Running Costs of Compressor.*—The running costs of the compressor are naturally dependent on the load imposed upon it—the nearer the compressor comes to working at its rated capacity over a number of hours (which entails evening out the load factor), then the lower do the running costs per therm of gas distributed become (see Appendix A).

The main item of importance is the cost of steam, which is valued at 18d. per 1,000 lb.

The labour entailed in stopping and starting compressor, changing oil, and periodic inspection, amounts to approximately 2½ hours daily; with a compressor working day of 15 hours and rate per man-hour of 1s. 6d., therefore cost per hour equals 3d.

Lubrication: Approximately 8 gallons per week of lubricating oil are used, as, although oil from the crank case is filtered and returned, yet the oil which passes through the automatic lubrication system goes to waste after fulfilling its purpose. At 3s. per gallon, cost per hour equals 2.74d.

For the purposes of cooling the gas cylinders approximately 60 gallons of town's water per hour are employed, which at 1s. 2½d. per 1,000 gallons equals 0.87d. per hour.

Total running costs per 1,000 cu.ft. are then cost of steam plus that of labour, lubrication, and water, while to obtain the final cost it is necessary to add the amount due to standing charges.

Appendix A summarizes these costs, which are dependent on load and pressure as shown.

Effect of War

When these figures are corrected to wartime values (see Appendix) —namely, items 3 and 4 as before, item 5 plus 60%, item 7 steam, 22d. per 1,000 lb., labour plus 33⅓%, lubricating oil plus 50%, town water, no change, it will be seen that the increased cost per 1,000 is only about 0.5d. (or 0.11d. per therm).

With regard to distribution generally, the policy adopted during the war by most undertakings, including my own, has been to increase existing charges, and also charge for many jobs which were previously done without cost to the consumer. Thus the supply side, in view of its decreased personnel, large wartime loads with low distribution costs, and increased all-round charges, may be said to be costing the undertaking certainly no more per therm to-day than pre-war.

APPENDIX A.

High Pressure Distribution.

Capital Cost.

Main: The length and price of the double wrapped steel main as purchased was 8 in. diameter 20,948 ft. at 3s. 10½d. per foot, 6 in. diameter 20,300 ft. at 2s. 8½d. per foot, and 2,414 ft. of 4 in. diameter at 1s. 8½d. per foot.

Mainlaying: Cost per effective yard for mainlaying only was dependent on this surface, thus:

	8 in. dia.	6 in. dia.	4 in. dia.
	s. d.	s. d.	s. d.
Grass verge	3 10½	3 2	2 5
Blue brick footway	4 5	3 6	—
Asphalt footway	—	—	2 5
Macadam country lane	4 7	3 10	—
Flags	4 3	3 6	—
Flags and cinder 50/50	4 1	3 3	—
Gravel and cinders	3 11½	3 2½	—
Within gas-works yard	4 0	—	—
Extra joints over one every 12 yards ...	6 3	4 3	3 0

Surfaces: The road and path surfaces comprised approximately:

Lineal yards.		Lineal yards.	
430 within gas-works site ...	8 in.	2,580 Macadam country lane	6 in.
300 Blue brick footway ...	"	3,830 Grass verge	"
670 Gravel or cinder ...	"	400 Tarsprayed road ...	"
2,900 Flags	"	600 Grass verge	4 in.
2,500 Flags and cinder 50/50	"	200 Asphalt footpath ...	"
200 Road crossings tarmac	"	25 Tarmac road crossings	"
50 Road crossings tarmac	6 in.		

Total Capital Cost was therefore:

Compressors	£2,350
3 District governors	488
Main—8 in. diameter	4,201
6 in. "	2,779
4 in. "	204
Mainlaying	2,971
Mainlaying reinstatement of roads	1,067
Connexions to governors and compressors, &c. ...	155
Steam mains, valves, &c.	80
Compressor house (including foundation, building, lighting, &c.)	590
Pulsation tank (scrap value and removal)	200
	£15,085

Total standing charges (items 2, 3, 4, and 5):	
Interest payable on capital cost	£509 2 0
Allocation to sinking fund	394 1 0
Cost of repairs and maintenance	150 17 0
Total	£1,054 0 0

Assuming a 15-hour day, 365 days per year—*i.e.*, 5,475 working hours—then cost per working hour = 46.2d.

Therefore cost per 1,000 cu.ft. of gas distributed will be:

Quantity passed ...	25	40	50	60	70	80	90	100
Cost (pence) ...	1.85	1.15	0.92	0.77	0.66	0.58	0.51	0.46

Running Costs (item 7):

Steam Costs under Varying Loads.

Gas pressure	15	25	30	35	40	...	15	25	30	35	40
Load cu.ft. per hour.	Steam consumption per hour—lb. per 1,000 cu.ft.						Cost per hour—pence per 1,000 cu.ft.				
25,000 ...	60	96	126	156	184	...	1.08	1.73	2.27	2.81	3.31
40,000 ...	50	73	90	108	126	...	0.90	1.31	1.62	1.94	2.27
50,000 ...	43	64	80	94	110	...	0.77	1.15	1.44	1.69	1.98
60,000 ...	41	60	73	85	99	...	0.74	1.08	1.31	1.53	1.78
70,000 ...	40	57	69	80	93	...	0.72	1.03	1.24	1.44	1.67
80,000 ...	40	56	66	77	88	...	0.72	1.01	1.19	1.39	1.58
90,000 ...	40	56	65	76	86	...	0.72	1.01	1.17	1.37	1.55
100,000 ...	40	56	65	74	84	...	0.72	1.01	1.17	1.33	1.51

Cost of labour, lubrication, and cooling water=6.61d. per working hour, which is independent of pressure, but affected by quantity thus:

Load, 1,000 cu.ft.	25	40	50	60	70	80	90	100
Cost (pence per 1,000)	0.26	0.17	0.13	0.11	0.09	0.08	0.07	0.07

Total running costs in pence per 1,000 cu.ft. of gas compressed. Final cost/1,000 cu.ft. as distributed to outlet governors.

Load 1,000 cu.ft. per hour.	Pressure, lb. per sq.in.					...	Gas pressure, lb. per sq.in.				
	15	25	30	35	40	...	15	25	30	35	40
25 ...	1.34	1.99	2.53	3.07	3.57	...	3.19	3.84	4.38	4.92	5.42
40 ...	1.07	1.48	1.79	2.11	2.44	...	2.22	2.63	2.94	3.26	3.59
50 ...	.90	1.28	1.57	1.82	2.11	...	1.82	2.2	2.49	2.74	3.03
60 ...	.85	1.19	1.42	1.64	1.89	...	1.62	1.96	2.19	2.41	2.66
70 ...	.81	1.12	1.33	1.53	1.76	...	1.47	1.78	1.99	2.19	2.42
80 ...	.80	1.09	1.27	1.47	1.66	...	1.38	1.67	1.85	2.05	2.24
90 ...	.79	1.08	1.24	1.44	1.62	...	1.30	1.59	1.75	1.95	2.13
100 ...	.79	1.08	1.24	1.40	1.58	...	1.25	1.54	1.70	1.86	2.04

Costs June, 1943.

Cost per 1,000 cu.ft. in pence for total standing charges=50.13d. per hour.
Total running costs and final cost per 1,000 cu.ft. now are:

Load 1,000 cu.ft. per hour.	15	25	30	35	40	...	15	25	30	35	40
	Total running costs in pence per 1,000 cu.ft.						Final costs per 1,000 cu.ft.				
25 ...	1.68	2.47	3.13	3.79	4.41	...	3.69	4.48	5.14	5.80	6.42
40 ...	1.32	1.83	2.20	2.60	2.99	...	2.57	3.08	3.45	3.85	4.24
50 ...	1.13	1.59	1.94	2.25	2.60	...	2.13	2.59	2.94	3.25	3.60
60 ...	1.05	1.47	1.76	2.02	2.33	...	1.89	2.31	2.60	2.86	3.17
70 ...	1.01	1.38	1.65	1.89	2.18	...	1.73	2.10	2.37	2.61	2.90
80 ...	.99	1.34	1.56	1.80	2.05	...	1.62	1.97	2.19	2.43	2.68
90 ...	.98	1.33	1.53	1.77	1.99	...	1.54	1.89	2.09	2.33	2.55
100 ...	.97	1.32	1.52	1.72	1.94	...	1.47	1.82	2.02	2.22	2.44

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DESIGN OF TEA BOILERS

L.M.S. Railway's New Type

The following is a communication received from the Research Department of the L.M.S. Railway Company:

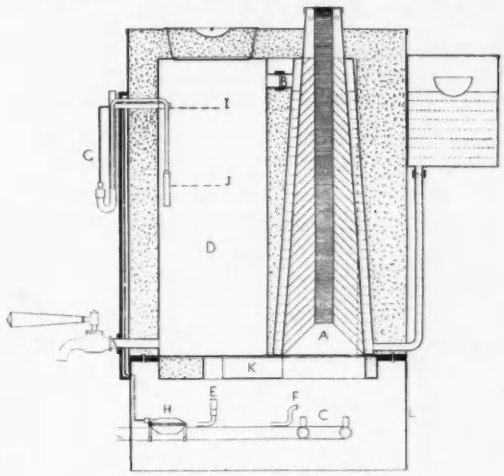
The design of a boiler for providing water for tea-making in canteens, &c., is governed by two important demands which the apparatus must fulfil. First, in order that there shall be no undue delay in making tea, a certain minimum rate of delivery must be maintained depending on the number of people to be served at one time. Even with a small canteen of about 50 people this rate cannot conveniently be less than 15 gallons per hour, whereby, if only one half-pint of water is required by each person, a period of 13 minutes will be required for the delivery of the water. Secondly, the water in the boiler must always be at boiling-point.

This problem is often tackled directly in gas boilers by constructing a heater capable of delivering boiling water at the required rate, and maintaining the water at the boiling-point by means of a by-pass flame when no withdrawal is being made. To obtain efficiently the rapid heating required to deliver boiling water at a rate at least as great as 15 gallons per hour a large heating surface must be used and therefore, conversely, when the gas is turned down the rate of heat loss from the surface is large unless the flue is fitted with an automatic damper. It is naturally impossible to lag this surface, and therefore a relatively high gas consumption is necessary on the by-pass to maintain the water at the boiling-point.

It is characteristic of the service which boilers have to perform in canteens providing tea at certain fixed periods during the day that the full demand is only required during a small fraction of the total time the boiler is in operation; during the major part of the time the water is being maintained at the boiling-point on the by-pass flame. When the by-pass consumption is high, it has been found that, of the total gas used, about 50% may be required to deliver the water, and the rest keeps the water at the boiling-point. It is quite possible that under some conditions of canteen operation the gas used for the latter purpose may exceed the former. Therefore, although the heater may have been carefully planned to work at a high efficiency when delivering water, much of the benefit of this design is lost in service when the by-pass consumption makes the overall efficiency only about half that of the heater. If there is such freedom of control that the by-pass gas can be increased by the operator when scaling of the water-side of the heating surfaces makes the delivery of boiling water no longer instantaneous, the overall efficiency in some designs may fall into the region of 10–15%.

Rate of delivery and heating surface, which are so inconveniently interrelated in this type of boiler, can be separated by combining together a small water heater and a storage boiler, so that a considerable quantity of boiling water is initially available in the latter and all water withdrawn is replaced more slowly by the heater. The rate of delivery from the boiler depends only on the bore of the tap, and the quantity of water available over short periods of heavy demand, on its capacity. By lagging the combination, a small flame playing on a small exposed heating surface of the storage boiler is sufficient to keep the water at the boiling-point, and it is possible to dispense with the by-pass flame for the water heater because boiling water is now always available from the storage boiler. The water heater has a small capacity and heating surface, and soon begins to replace water withdrawn when the gas is switched on. As an example of the service which can be provided in a design which combines a storage boiler of 3 gallons capacity and a heater capable of replacing 3 gallons of boiling water per hour, a maximum quantity of 6 gallons can be obtained in the first hour when the boiler is full. If 3 gallons are quickly withdrawn, it is necessary to wait for an hour before the same quantity can be again obtained, but half a gallon is available in 10 minutes, one gallon in 20 minutes, and so on. The boiler, therefore, contains varying quantities of boiling water. It is also expected that ease of de-scaling will be a further advantage of this design, because the heater can be made to be easily detachable from the boiler. A boiler of this type is shown diagrammatically in the accompanying sketch.

The heater, A, with a conical central flue and outer annular water space, is supplied with water by a small constant level ball-valve tank. The water level is normally below the exit B, but when the non-aerated burner C below the flue is switched on and the water boils, the difference in density created causes boiling water to pass over into the storage boiler D. The water in the latter is maintained at the boiling-point by a small burner E, which plays directly on to its base. The products of combustion from E pass through a small duct into the water-heater flue, which therefore receives some heat even when burner C is turned off. F is a relighting jet for burner C. The gas supply to C is controlled by the water level in the storage boiler D through the "gas switch" G. This consists essentially of a U-tube connected to a gas valve closed by a diaphragm H. When the level in D reaches I water overflows into the tube, quickly filling it and placing a pressure greater than the gas pressure, which is controlled by a governor, on the top of the diaphragm. A syphon tube passes from the side of the U-tube above the level I into the storage boiler. When water is withdrawn from the boiler and the level J is reached, the syphon starts and reduces quickly the water pressure in the U-tube to an amount



less than the gas pressure, thus allowing the diaphragm valve to open. It does not close again until the water level reaches I. In the model, the levels I and J correspond to capacities of approximately 4 and 3 gallons respectively. The gas to the burner C is therefore only switched on when at least one gallon of water has to be replaced. This eliminates the frequent reheatings and subsequent coolings of the flue, with the corresponding loss in efficiency, which occur when small quantities of water are withdrawn or evaporated and the gas supply is controlled by a valve attached to a float.

The whole unit is enclosed in a cylinder of lagging, which can be quickly opened to allow the removal of the water heater A simply by breaking the union at B and the connexion to the constant level tank. The insulating material is held against the bottom of the boiler by means of a tray K, in which are holes corresponding to the burners C and E, and a duct leading the waste gases from E into the flue. The gas governor, diaphragm valve and burners are attached to the stand L which supports the lagged unit and is insulated from it by means of an asbestos ring.

For a storage capacity of 4 gallons and a heater capable of replacing 3–4 gallons per hour, the boiler without the constant level tank is a cylinder of height 24 in. and diameter 15 in.

The design is due to Mr. S. Bairstow, of the L.M.S. Railway Company's Research Department.

The Search for Oil

At a Meeting held at the Cheltenham Art Gallery last month the question of the search for oil in Great Britain was reviewed by Mr. John Roberts, D.I.C., in the light of a rather novel theory as to the origin of oil. The lecturer first of all discussed the world distribution of oilfields, and showed, with the aid of lantern slides, that all the oilfields of the world are closely associated with the great mountain ranges, such as the Carpathians, Caucasians, Apennines, Himalayas, Arakan Yomas, Andes, Rocky Mountains and the Appalachian Chains. He then went on to show that certain rocks in these mountain chains, such as anthracite and marble, have been thoroughly studied, and their formation temperatures determined. Thus marble has been formed at about 900°C., as demonstrated by Sir James Hall in 1805, and anthracite at about 550°C., as shown by the lecturer in 1924. The evidence in support of this was discussed at some length. Using these rocks as "natural pyrometers" in this manner, it was shown that every great mountain system has been, in the past, a region of high temperature, which Mr. Roberts regards as a "retort" or "generator," which brought about the natural distillation of the oil-yielding rocks. The volatile substances were expelled from the distillation zone to cooler regions where the conditions were favourable for condensation, and there the oils have accumulated. Those areas are the "condensers," and the generators and condensers are always parallel.

Remarkably striking illustrations were given from Italy, the Caucasians and the Carpathians, showing that the oilfields invariably follow the contour of the foot-hills of the mountain ranges. From the facts disclosed, it is naturally concluded that in searching for oil in new territory it is of the first importance to study the mountain ranges, or the "backbone" of each country, as it is mainly along the flanks of these "backbones," or regions of great rock disturbance, that any real quantities of oil are obtained.

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Dec. 6.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

The new Coal Tar Products Prices Order, 1943 (S. R. & O. 1528), came into force on Nov. 15, fixing the prices at which Coal Tar Oils may be sold for various specified purposes. It also confirms the prices which may be charged for other Coal Tar Products under earlier Orders.

An Order entitled The Control of Toluene (No. 3) Order, 1943 (S. R. & O. 1943, No. 976), came into force on July 20, and introduced certain changes in the prices for different grades of Toluene.

There are no changes to report in the prices of Coal Tar Products.

The Provinces Dec. 6.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 11d. to 2s. 1d., pure, 2s. 7½d. (controlled by the Control of Toluene No. 3 Order, dated July 14, 1943, operative from July 20, 1943). Naphtha and Xylole controlled by the Coal Tar Naphtha and Xylole Order, 1943, dated May 31 (S. R. & O., 1943, No. 768), operative from June 1. Carbolic acid, 60's, naphthalene, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland Dec. 4.

No change can be recorded with market continuing active. Refined tar*: Yield to Distillers is 4½d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzol absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 6½d. to 7d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Markets were quiet and irregular at the opening last week, but towards the close conditions became a little brighter, although there was very little expansion in volume.

Business in Gas stocks and shares, on the other hand, was a little heavier, but except in a few instances price changes were in a downward direction. Among the rises a feature was the gain of 4½ in Bath Consolidated at Bristol, while the falls were mainly among the fixed-interest stocks.

In the full lists published in the "JOURNAL" on December 1, it is regretted that the dividends paid on the Associated Gas and Water Undertakings deferred stock were omitted. These should have read 6% p.a. for the last and previous half years.

The following price changes took place during the week:

SUPPLEMENTARY LIST

Bristol 4 p.c. New Deb.	95—100	−2
Croydon 4 p.c. Deb.	98—103	−2
Reading 4 p.c. Deb.	95—100	−2
Uxbridge 5 p.c. Deb.	115—120	−2

OFFICIAL LIST

Bournemouth 4 p.c. Deb.	102—107	−3
Commercial	65—68	−1
Croydon 5 p.c. Deb.	117—122	−3
Gas Light 3 p.c. Deb. (x.d.)	82—85	Nov. 29
Ditto 5 p.c. Red. Deb. (x.d.)	106—109	"
Ditto 4½ p.c. Red. Deb. (x.d.)	105—108	"
Imperial Continental	85—88	−1
Plymouth & Stonehouse	100—105	+1
South-Eastern Gas Corporation 4½ p.c. Pref.	20/—21/—	+−/3d.
South Suburban 4 p.c. Pref.	91—96	+2
Wandsworth 4 p.c. Deb.	98—103	−1

PROVINCIAL EXCHANGES

Bath Cons.	107—109	+4½
Liverpool Ord.	111½—112½	+½
Newcastle Units	24/—24/6	+−/3d.

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